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Many chemists profess admiration for metric units such as those of the Système International d'Unités (designated SI in all languages) with its minimal number of arbitrary standards. But chemists also respect the tradition that each important physical quantity deserves its own independent unit. They thus find acceptable arbitrary units such as the atmosphere and the torr. This duality of action, vocal support for simplicity but its avoidance in practice, is in accord with the honored traditions of our profession as set forth by that illustrious pioneer in chemistry, Theophrastus Bombast von Hohenheim (Paracelsus) from whose name the word "bombast" is derived.

Where a unit for pressure with the characteristics of force per unit area is recognized, conversion of a barometer reading to this pressure unit is often needed. This conversion is conveniently provided by a table such as the accompanying Table 1 which also includes correction for barometer temperature. Entry here is with a barometer reading in millimeters and with barometer temperature in Celsius degrees. Atmospheric pressure in millibars is obtained. The table applies to a Fortin (adjustable cistern) barometer with the expansivities for mercury and for brass from the International Meteorological Tables.

In the chemistry laboratory there are many experiments where the vapor pressure of water is of concern. Most chemistry handbooks do not use true metric units for this vapor pressure. However, such a table is given in the Smithsonian Meteorological Tables, and an excerpt (Table 2) is included here.

The millibar unit for these tables, although metric in nature, is not a direct part of the Système International, and neither are the associated units, kilobar, bar, and microbar. The bar, however, is a pressure of 10^5 pascals (the SI unit, newtons per square meter), and also the microbar corresponds to the cgs pressure unit of dynes per square centimeter. A pressure of one bar represents a metric atmosphere, and corresponds closely to our "normal" atmosphere of 1.01325 bar. Also, the millibar approximates a pressure of one torr (supposedly identical with the millimeter of mercury). Either torr or millimeter of mercury can be converted to the millibar almost exactly by the simple multiple 4/3 (to within one part in ten thousand).

Where metric units are accepted, metric values for the gas law constant are needed. This gas law constant is 83.143 mbar-l (or bar-ml)/mole-Kelvin (where the liter is taken as the cubic decimeter). This interesting number is comparable with the value 82.06 for pressures in arbitrary atmospheres. The gas constant 0.083143 bar-l/mole-Kelvin has similar interesting aspects.

Table 1. Atmospheric Pressure in Millibars from Barometer Reading

Reading (mmHg)	Barometer Temperature (°C) 20	22	24	26	28	30
721	958.1	957.8	957.5	957.2	956.9	956.6
722	959.5	959.1	958.8	958.5	958.2	957.9
723	960.8	960.5	960.2	959.8	959.5	959.2
724	962.1	961.8	961.5	961.2	960.9	960.5
725	963.4	963.1	962.8	962.5	962.2	961.9
726	964.8	964.5	964.1	963.8	963.5	963.2
727	966.1	965.8	965.5	965.2	964.8	964.5
728	967.4	967.1	966.8	966.5	966.2	965.9
729	968.8	968.4	968.1	967.8	967.5	967.2
730	970.1	969.8	969.5	969.1	968.8	968.5
731	971.4	971.1	970.8	970.5	970.1	969.8
732	972.7	972.4	972.1	971.8	971.5	971.2
733	974.1	973.8	973.4	973.1	972.8	972.5
734	975.4	975.1	974.8	974.4	974.1	973.8
735	976.7	976.4	976.1	975.8	975.5	975.1
736	978.1	977.7	977.4	977.1	976.8	976.5
737	979.4	979.1	978.7	978.4	978.1	977.8
738	980.7	980.4	980.1	979.8	979.4	979.1
739	982.0	981.7	981.4	981.1	980.8	980.4
740	983.4	983.1	982.7	982.4	982.1	981.8
741	984.7	984.4	984.1	983.7	983.4	983.1
742	986.0	985.7	985.4	985.1	984.7	984.4
743	987.4	987.0	986.7	986.4	986.1	985.8
744	988.7	988.4	988.0	987.7	987.4	987.1
745	990.0	989.7	989.4	989.1	988.7	988.4
746	991.3	991.0	990.7	990.4	990.1	989.7
747	992.7	992.4	992.0	991.7	991.4	991.1
748	994.0	993.7	993.4	993.0	992.7	992.4
749	995.3	995.0	994.7	994.4	994.0	993.7
750	996.7	996.3	996.0	995.7	995.4	995.0
751	998.0	997.7	997.3	997.0	996.7	996.4
752	999.3	999.0	998.7	998.3	998.0	997.7
753	1000.6	1000.3	1000.0	999.7	999.3	999.0
754	1002.0	1001.7	1001.3	1001.0	1000.7	1000.3
755	1003.3	1003.0	1002.7	1002.3	1002.0	1001.7
756	1004.6	1004.3	1004.0	1003.7	1003.3	1003.0
757	1006.0	1005.6	1005.3	1005.0	1004.7	1004.3
758	1007.3	1007.0	1006.6	1006.3	1006.0	1005.7
759	1008.6	1008.3	1008.0	1007.6	1007.3	1007.0
760	1010.0	1009.6	1009.3	1009.0	1008.6	1008.3
761	1011.3	1011.0	1010.6	1010.3	1010.0	1009.6
762	1012.6	1012.3	1011.9	1011.6	1011.3	1011.0
763	1013.9	1013.6	1013.3	1012.9	1012.6	1012.3
764	1015.3	1014.9	1014.6	1014.3	1013.9	1013.6
765	1016.6	1016.3	1015.9	1015.6	1015.3	1014.9
766	1017.9	1017.6	1017.3	1016.9	1016.6	1016.3
767	1019.3	1018.9	1018.6	1018.3	1017.9	1017.3
768	1020.6	1019.2	1019.9	1019.6	1019.3	1018.9
769	1021.9	1021.6	1021.2	1020.9	1020.6	1020.3
770	1023.2	1022.9	1022.6	1022.2	1021.9	1021.6

Proportional Parts

mmHg	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
mbar	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1.1	1.2

Table 2. Vapor Pressure of Water in True Metric Units

Temperature (°C)	Vapor Pressure of Water (mbar)	Temperature (°C)	Vapor Pressure of Water (mbar)
0	6.1	25	31.7
1	6.6	26	33.6
2	7.1	27	35.6
3	7.6	28	37.8
4	8.1	29	40.1
5	8.7	30	42.4
6	9.3	31	44.9
7	10.0	32	47.6
8	10.7	33	50.3
9	11.5	34	53.2
10	12.3	35	56.2
11	13.1	36	59.4
12	14.0	37	62.8
13	15.0	38	66.3
14	16.0	39	69.9
15	17.0	40	73.8
16	18.2	41	77.8
17	19.4	42	82.0
18	20.6	43	86.4
19	22.0	44	91.0
20	23.4	45	95.9
21	24.9	46	100.9
22	26.4	47	106.2
23	28.1	48	111.7
24	29.8	49	117.4
		50	123.4

These metric values are related by simple decimal multiple to the Système International value for the gas law constant, 8.3143 joules/mole-Kelvin.

Metric units are particularly convenient in computations involving the PV product for ideal gases, as when enthalpy is obtained from the internal energy, for the bar-liter comprises 100 joules. For example the PV product for the ideal gas at zero Celsius is 22.7106 bar-l/mole, or 2271.06 joules/mole. It is to be hoped that the numbers 83.143 and 22.7106 will replace the magic numbers 82.06 and 22.4 as true metric units gain respectability among chemists.

A copy of the metric tables of this note is available on request.